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AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the above-identified application:

Claims 1-21 (canceled):

Claim 22 (currently ameneded): A method of identifying unknown model parameters of a non-linear dynamic system model of an automobile powertrain system having one or more system inputs, the method comprising:

determining a governing state equation for the powertrain system from the powertrain system model;

determining a cost function based at least in part on one or more powertrain system performance objectives;

determining a perturbation state equation from the governing state equation for the powertrain system;

determining an adjoint equation from the governing state equation for the powertrain system;

determining an adjoint identity from the governing state equation for the powertrain system;

determining a perturbation cost function based at least in part on the determined adjoint equation, the determined perturbation state equation, and the determined adjoint identity;

determining a gradient based at least in part on the determined adjoint equation;

supplying the governing state equation, the adjoint equation, and the perturbation cost function to a general purpose processor; and

causing the general purpose processor to iteratively determine changes in the perturbation cost function that result from incremental changes in arbitrarily chosen values of one or more of the unknown powertrain system model parameters to thereby identify the unknown powertrain system model parameters.

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Claim 23 (currently amended): The method of Claim 22, further comprising:

determining one or more initial states for solving the governing state equation;

supplying one or more of the initial states to the general purpose processor; and

causing the general purpose processor to iteratively determine changes in the perturbation cost function that result from incremental changes in one or more of the initial states.

Claim 24 (original): The method of Claim 22, wherein:

the adjoint equation includes one or more adjoint states; and

the incremental changes are driven by gradients derived from the adjoint states.

Claim 25 (original): The method of Claim 22, wherein the changes in the cost function are iteratively determined until a specified accuracy criterion is met.

Claim 26 (original): The method of Claim 22, wherein the changes in the cost function are iteratively determined until a predetermined number of iterations is completed.

Claim 27 (original): The method of Claim 22, further comprising:

determining the state equation, cost function, adjoint equation, and gradient by supplying one or more exogenous inputs from powertrain system measurements or controller generated signals.

Claim 28 (canceled).

Claim 29 (original): The method of Claim 22, further comprising:

validating the non-linear dynamic model using the identified unknown powertrain system model parameters against one or more sets of ~~experimentally determined or simulated~~ data.

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